

Using Frequency Modulation to Detect Dead Regions

Results of a Pilot Experiment

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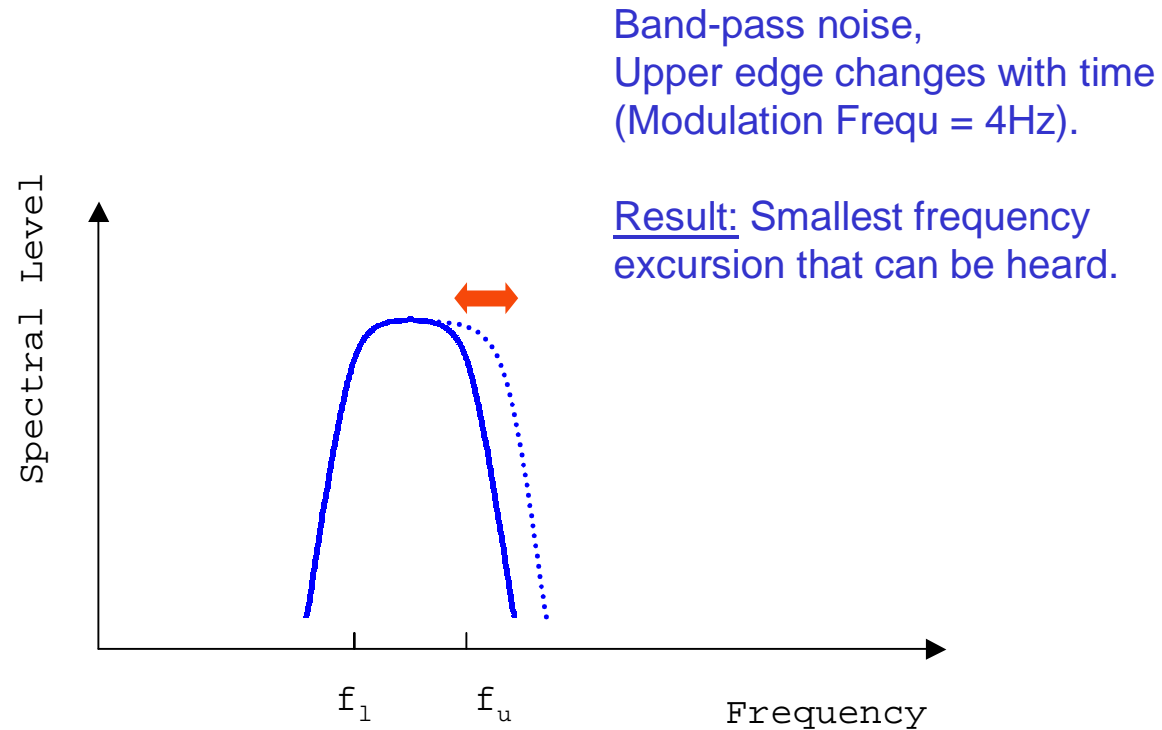
Outline

- Explore possibility of a new test for detecting Dead Regions
 - *Describe Rationale of Test*
 - *Present Data of Pilot Experiment*
 - *Compare with Results from TEN and Tuning Curve Test*

Proposed New Task:

Detection of Frequency Modulation

Signal Representation

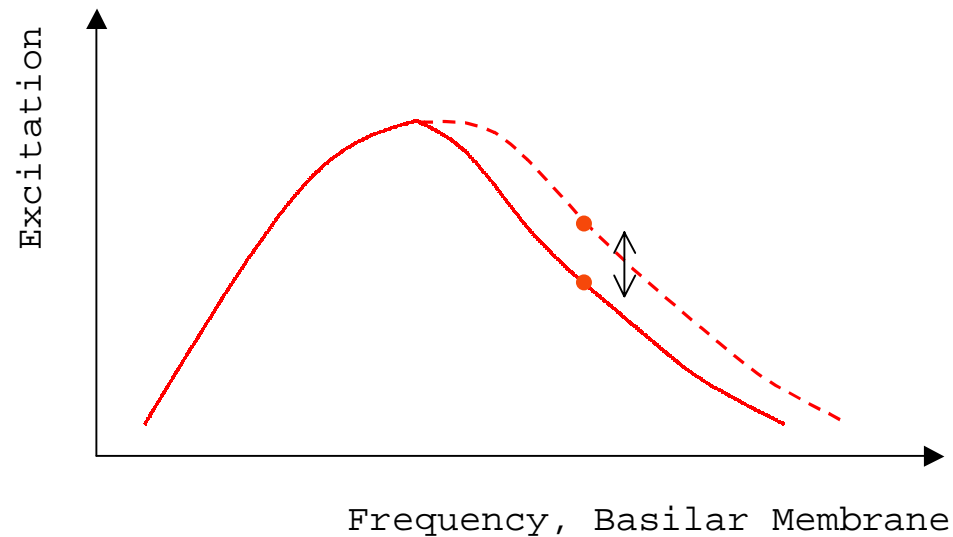


Proposed New Task:

Detection of Frequency Modulation

Internal Representation

- Maiwald, D. (1967)
- Florentine, M. and Buus, S. (1981)



Experiment: Objective

Compare

- Tuning Curve,
- TEN Test, and
- Frequency Modulation

in subjects with audiograms that are likely to exhibit Dead Regions.

Experiment: Method

Subjects:

- 8 Ears with steeply sloping audiograms

Signals and Procedure:

TUNING CURVE

- Békésy trace
- Fixed pure-tone probe
- swept narrow-band noise masker

TEN

- Threshold measured with forced-choice adaptive tracking.

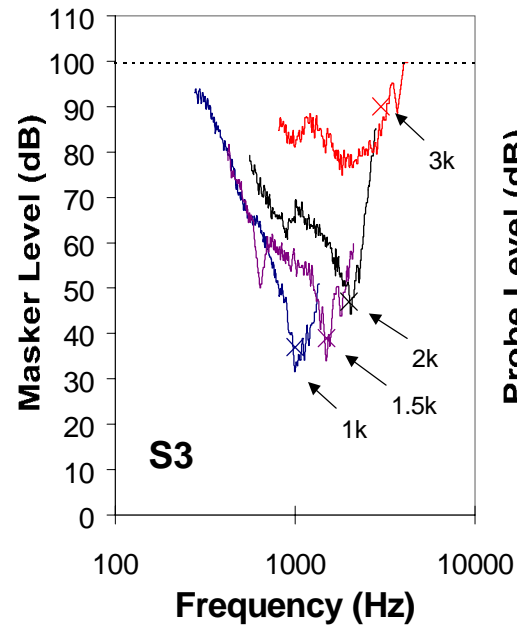
Experiment: Method (cont'd)

FREQUENCY MODULATION

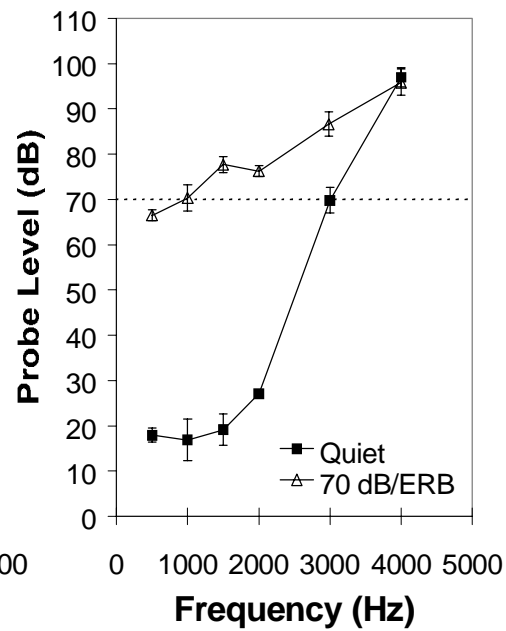
- Bandpass with upper edge centered at 1000, 1500, 2000, (3000) Hz
- Low-frequency edge 60% below nominal high-frequency edge
- Forced-choice adaptive track

Experiment: Results

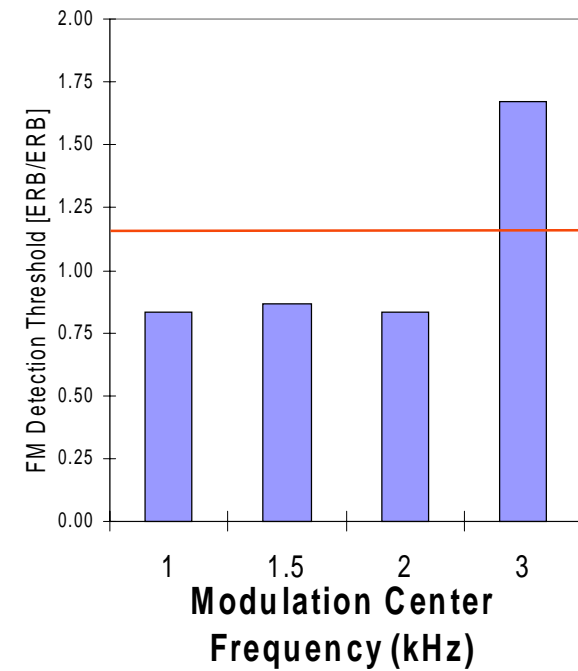
Tuning Curve



TEN Test



Modulation Detection



Experiment: Results (cont'd)

Subject	Tuning Curve	TEN	Modulation
S1	DR	DR	DR
S2	DR	?	?
S3	DR	DR	DR
S4	-----	DR	DR
S5	-----	DR	-----
S6	-----	DR	-----
S7	DR	DR	-----
S8	-----	-----	-----

DR = Dead Region detected; When a Dead Region was detected with two or more tasks, all tasks agreed about the edge frequency of the dead region.

? = The Tuning curve indicated a Dead Region at a frequency above the highest frequency encompassed in the TEN and FM protocols. It is therefore unknown whether these tasks would have detected the Dead Region.

Summary and Conclusions

A new method for determining Dead Regions was introduced.

The new method involves an easy detection task.
(Frequency Modulation - FM)

Pilot data on 8 ears suggest that FM has potential to detect Dead Regions (FM disagrees with Tuning Curve in 2 (of 8) ears; TEN test disagrees with Tuning Curve in 3 (of 8) ears)